سوناطراك

**sonatrach**

# Challenges for Digital oil field applications in Hassi-Messaoud Field (HMD), Sonatrach, Algeria

by

Ammar Nouacer (SH DP), Alban Collaku & Imad Bendjedia (SLB)

SLB SIS forum, September 18th, 2019

# Outline

- **Hassi Messaoud (HMD) field overview**

- **Detection of the Gas Lift well Performance Challenge**

- **Deployment of a Real Time Well Surveillance (RTWS) with Production Increase Objectives**

- **Early Production Drop Detection & Wells Ranking**

- **Advisors & Dashboards**

- **Recommendations & Actions Summary**

- **OLGA Modeling for Real Time Rates Estimation**

- **PIPESIM Modeling for Gas Lift Optimization**

- **RTWS Results & Way Forward**
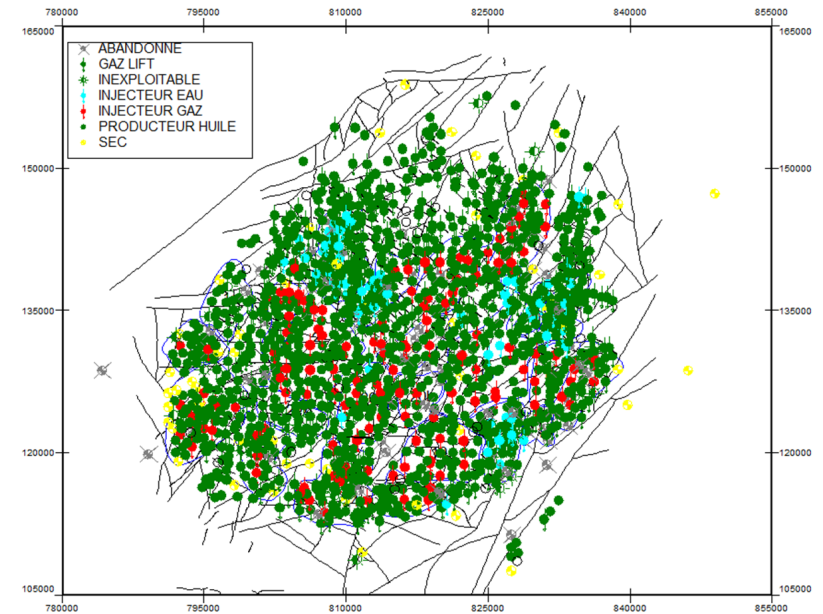
سوناطراك
sonatrach

**Schlumberger**

# Hassi Messaoud (HMD) field overview


Hassi Messaoud (HMD) field location - Google earth map
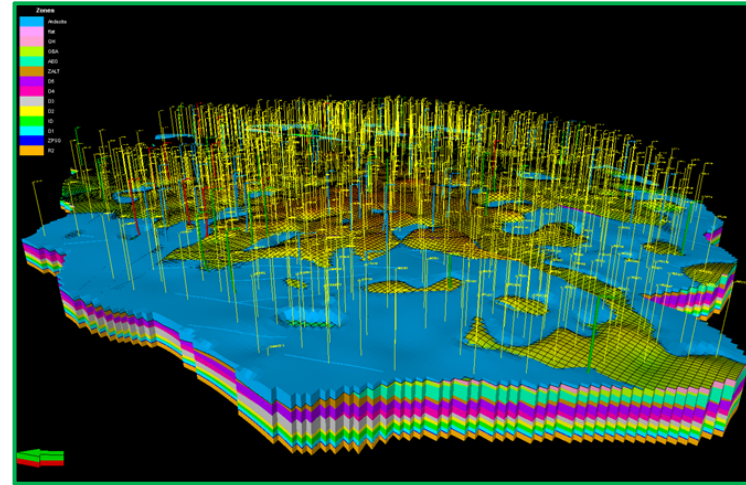

HMD Geological model


HMD wells status

The giant Hassi Messaoud field (HMD), operated by Sonatrach is one of the largest mature fields in the world. It was discovered in 1956 and put on production in 1958. It covers an area of 3 300 km2 with a total of 1800 wells. The field is under miscible flooding as well as waterflooding. About 40 % of the oil producer wells are artificially assisted with Gas lift.

The main challenges faced with direct influence on the well candidate selection for production optimization in the field are: Reservoir heterogeneity, Flow assurance issues (salt, asphaltene, scale … ), Gas and Water Breakthroughs, Completion, Operation executions and Network facilities. Combination of these challenges makes HMD unique for production optimization and digitalization.
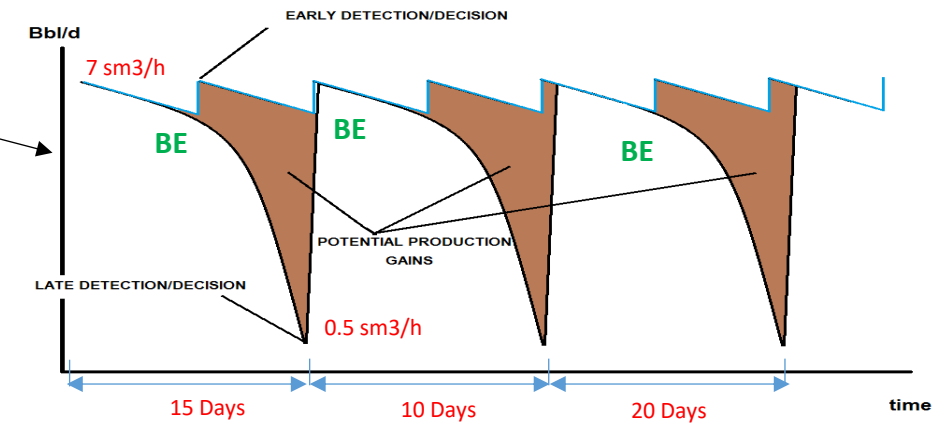
**Schlumberger**

# Detection of the Gas Lift well Performance Challenge

In 2016 Sonatrach DP asked to find a solution on the early detection of the production drop in GL wells and asked all service companies working in the field: **How to identify when a Gas Lift well is going to underperform before its production drops?**

The case of the GL well MDZ595 affected also by the salt precipitation became the test for all.
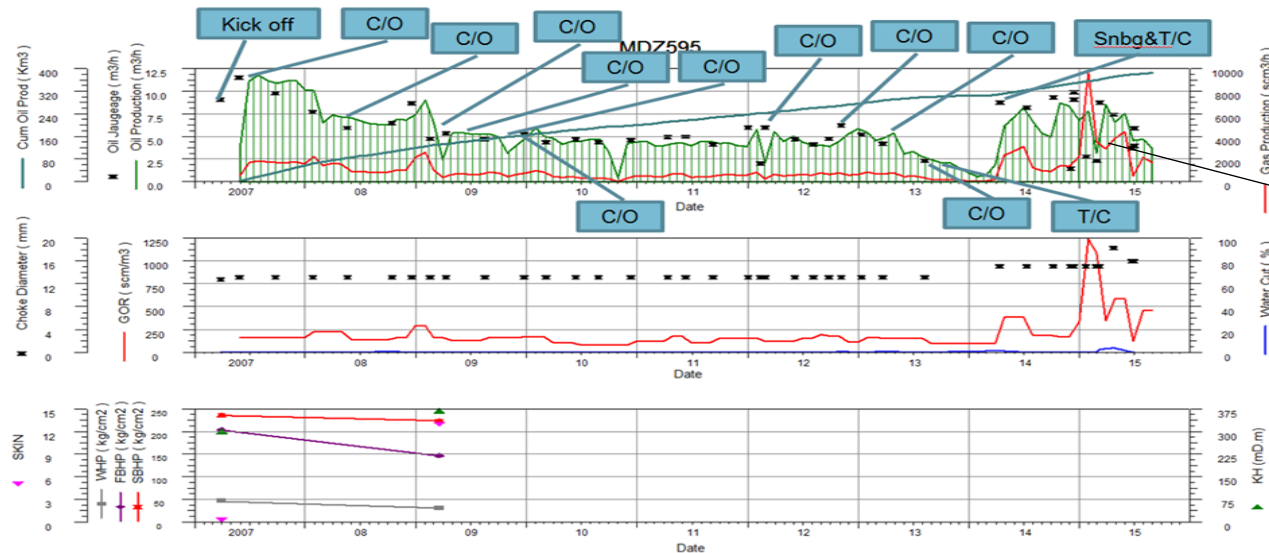
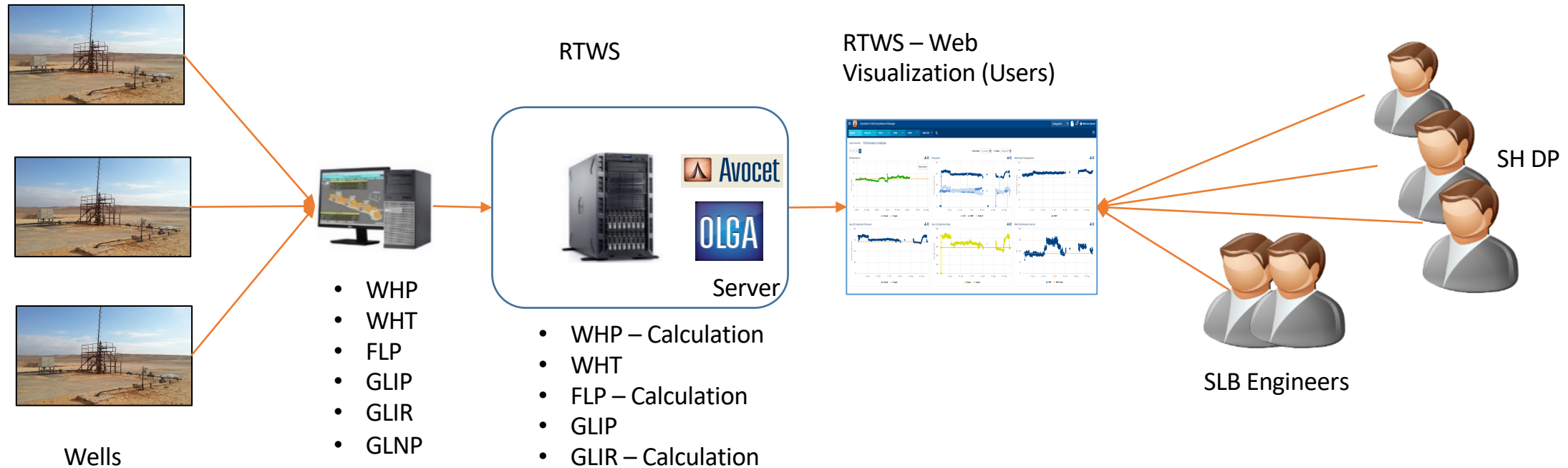

Production performance of the Well MDZ595

Schematic production behavior of a well in HMD field

# Deployment of a Real Time Well Surveillance (RTWS) with Production Increase Objective

The join team TAO (Schlumberger and Sonatrach DP) realized a detailed transient Gas lift study taking account all wellhead parameters (WHP, WHT, FLP, GLIP, GLIR, GLNP) followed by the deployment of a Real Time Well Surveillance (RTWS) application using **OLGA algorithms** have been put successfully in place in HMD field to answer the Sonatrach DP concerns.

It was followed by many other applications with direct influence on the main objective: **production increase.** Below will be presented the update on this on going project and our **objectives towards the HMD digital oilfield.**
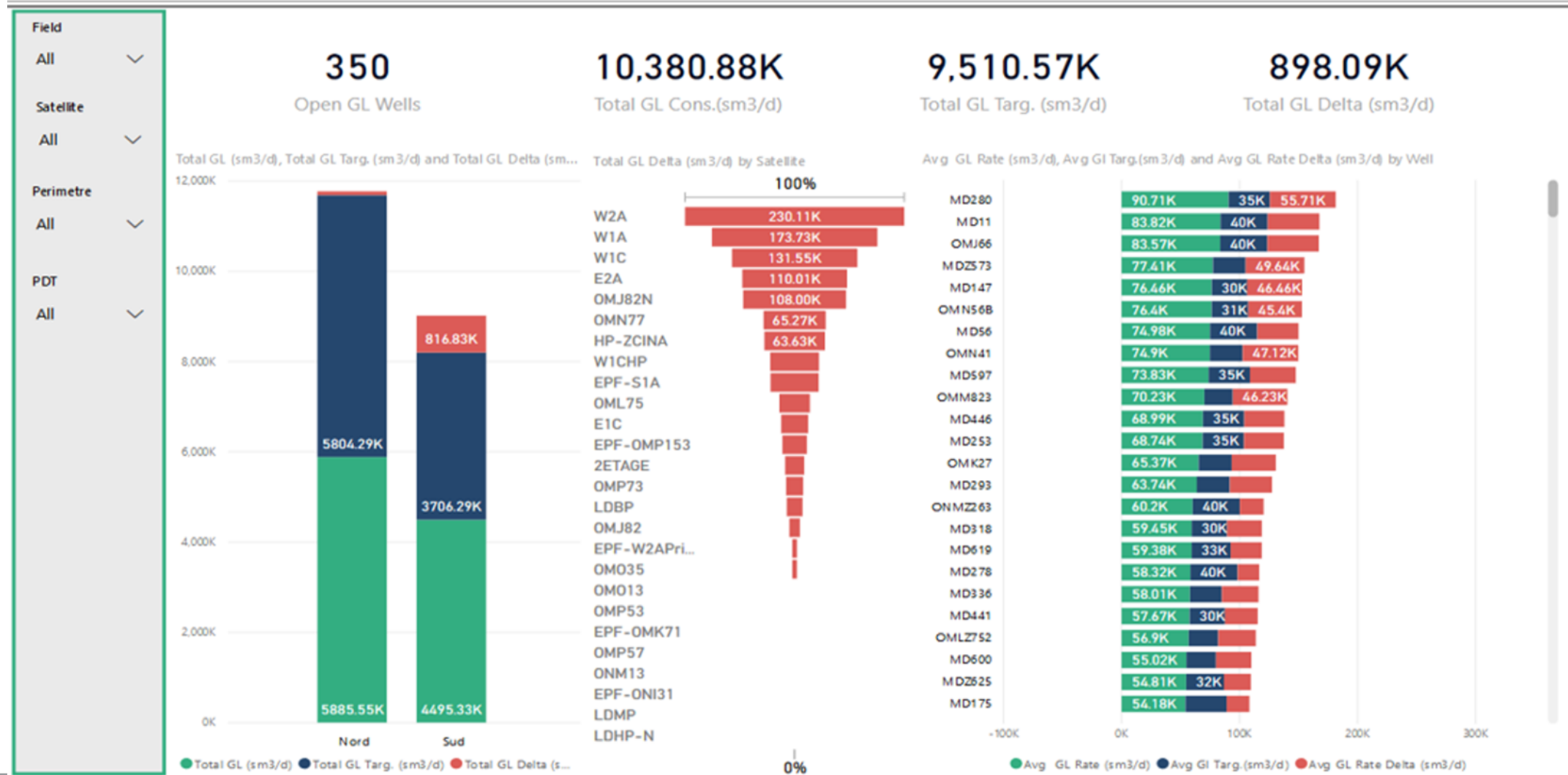


RTWS

RTWS – Web
Visualization (Users)

SH DP

Server

SLB Engineers

Wells

- WHP
- WHT
- FLP
- GLIP
- GLIR
- GLNP

- WHP – Calculation
- WHT
- FLP – Calculation
- GLIP
- GLIR – Calculation

**Schlumberger**

sonatrach

# Early Production Drop Detection & Wells Ranking

# Recommendations & Actions Summary
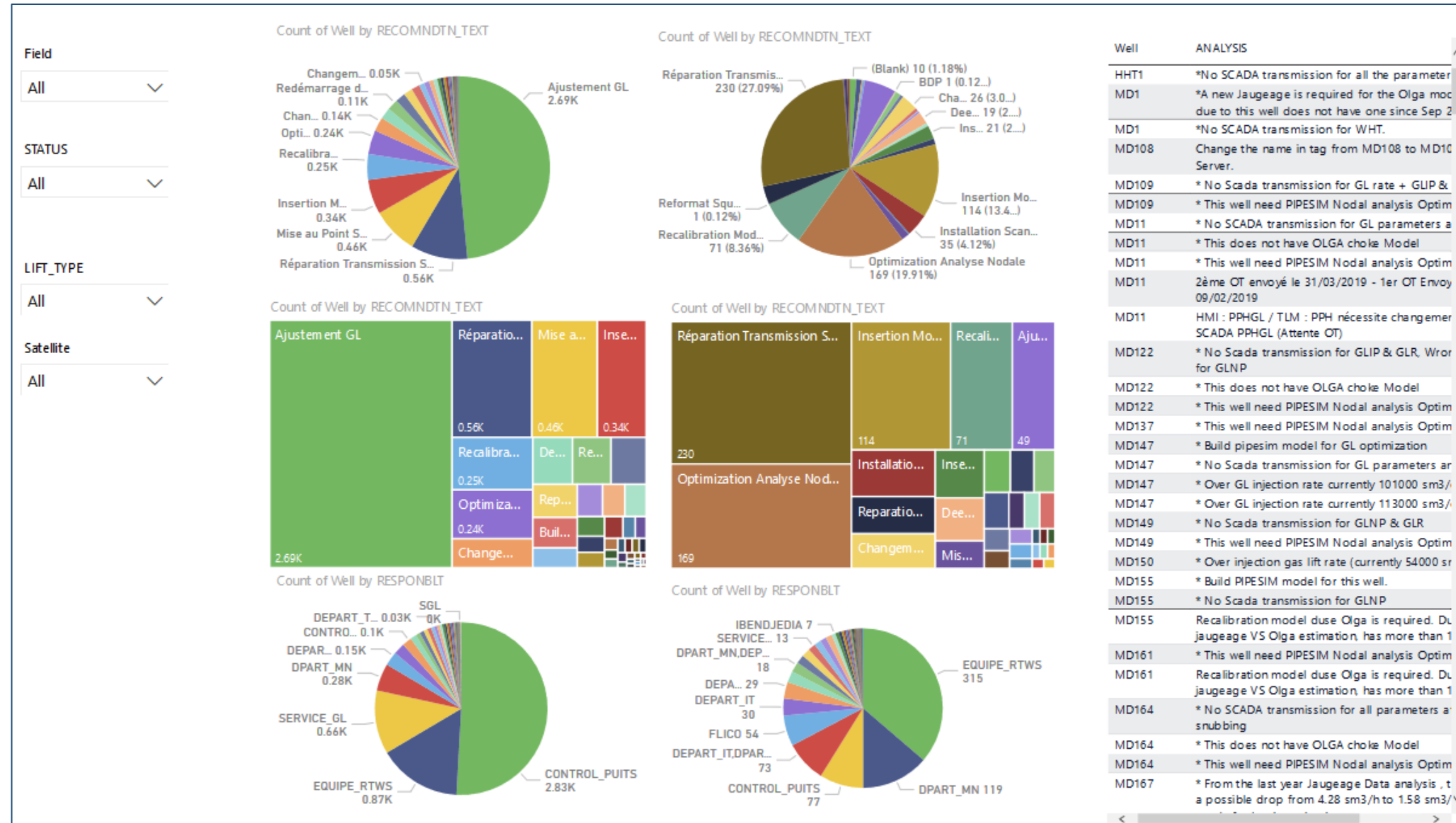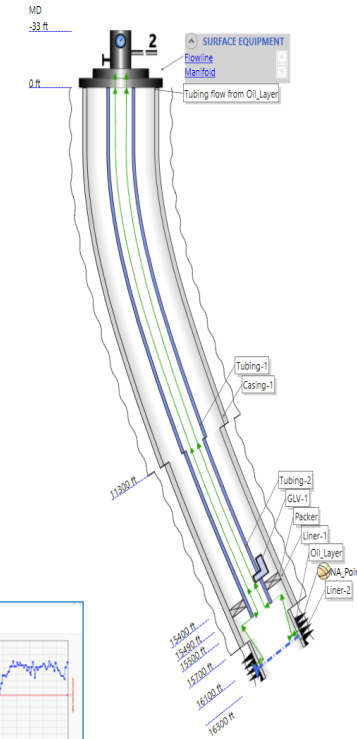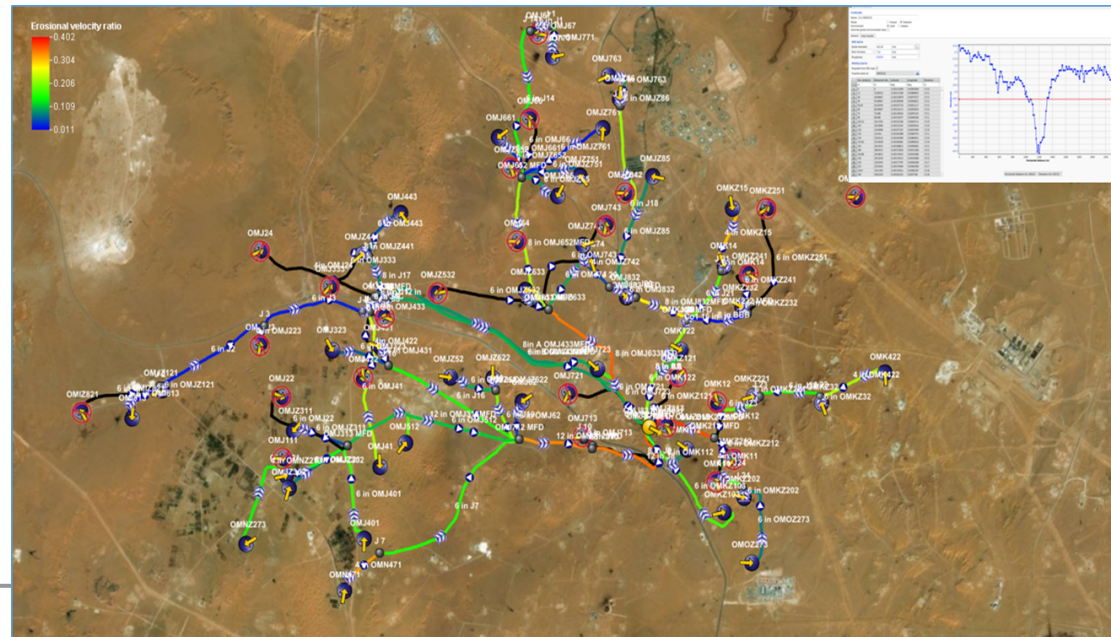
# OLGA Wells Modelling for Rates Estimation
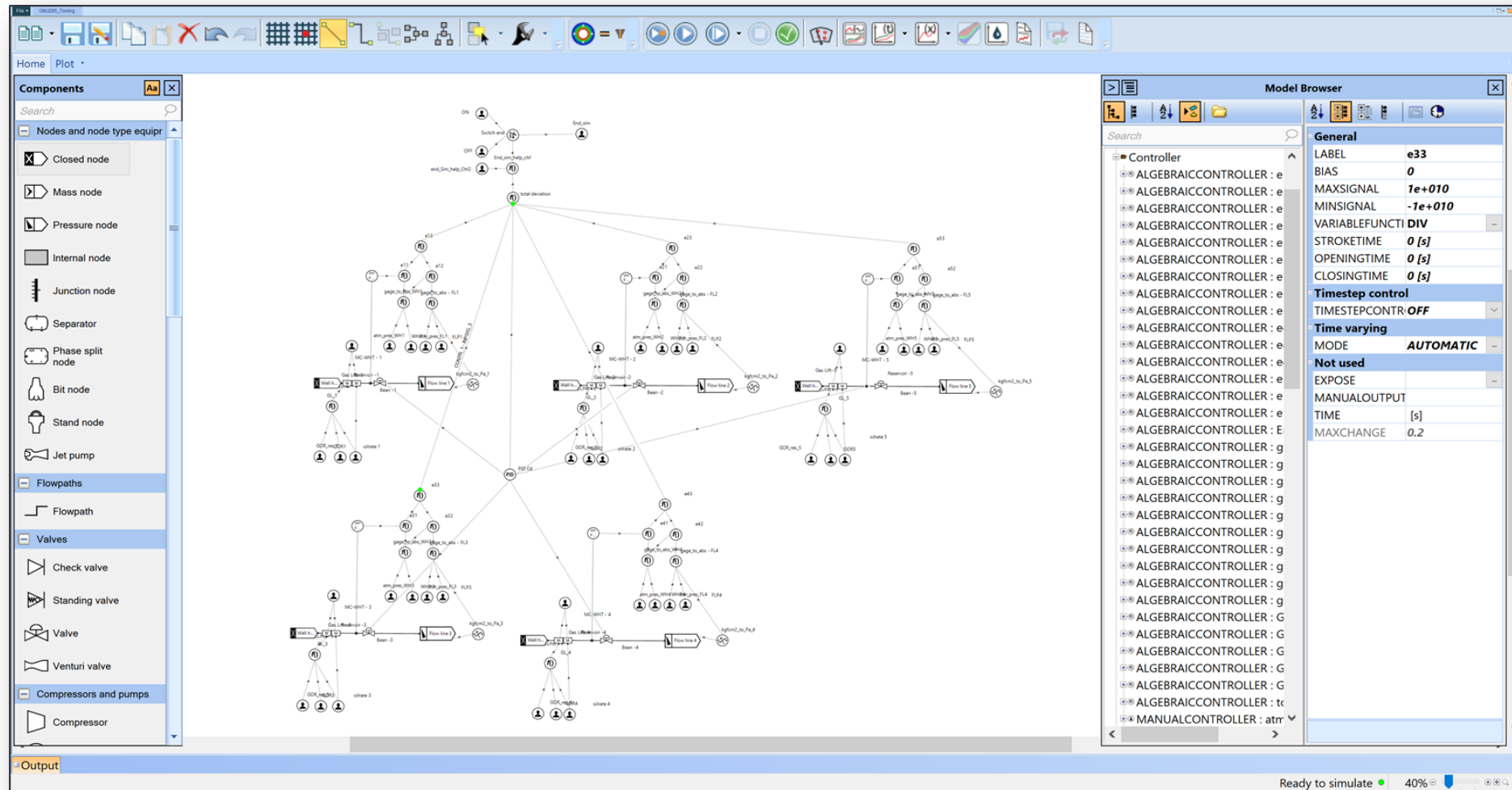


So far 70 % of GL Wells have OLGA Choke Model for Real Time Rates Estimation

# PIPESIM Modelling for Gas Lift Optimization

- **Wells modelling** : Assisted Gas Lift Optimization with PIPESIM Nodal Analysis

- **Network modeling** : More than 06 Manifold Accomplished and Models are up to date : W1C, OMJ82, OMJ82N E1C, OMP53, OMP73, ONM13



ONMZ37 optimized performance PI 1.4 sm3/d/bar, Pp 12.5 kg/cm2, W.C. 0%, P.choke 16 mm, CD 0.82,Qoil 2.9m3/h
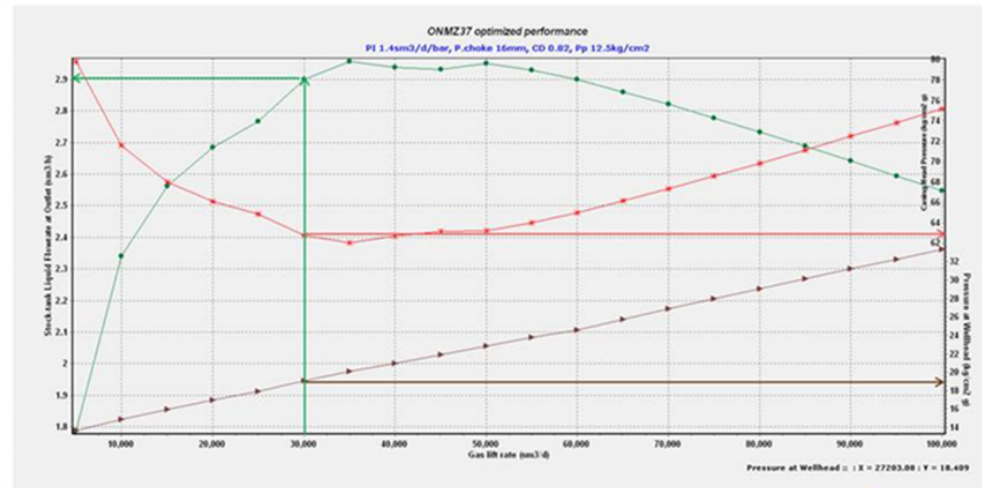
# Main Results and Way Forward

# Main Results:  Production Increase / Test in Manifold OMJ82 - OMJ82N



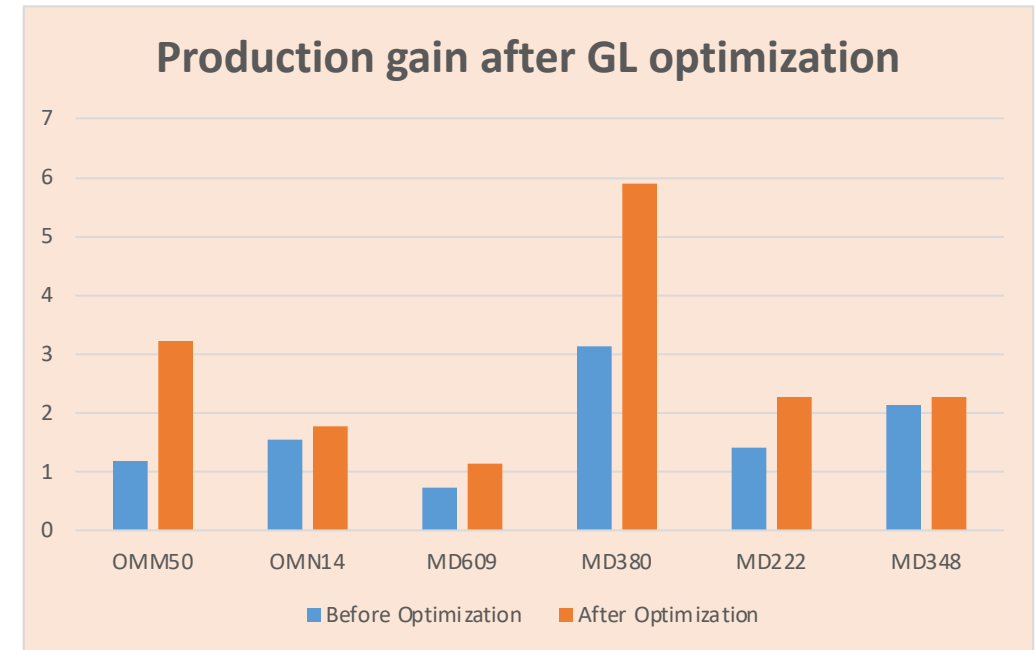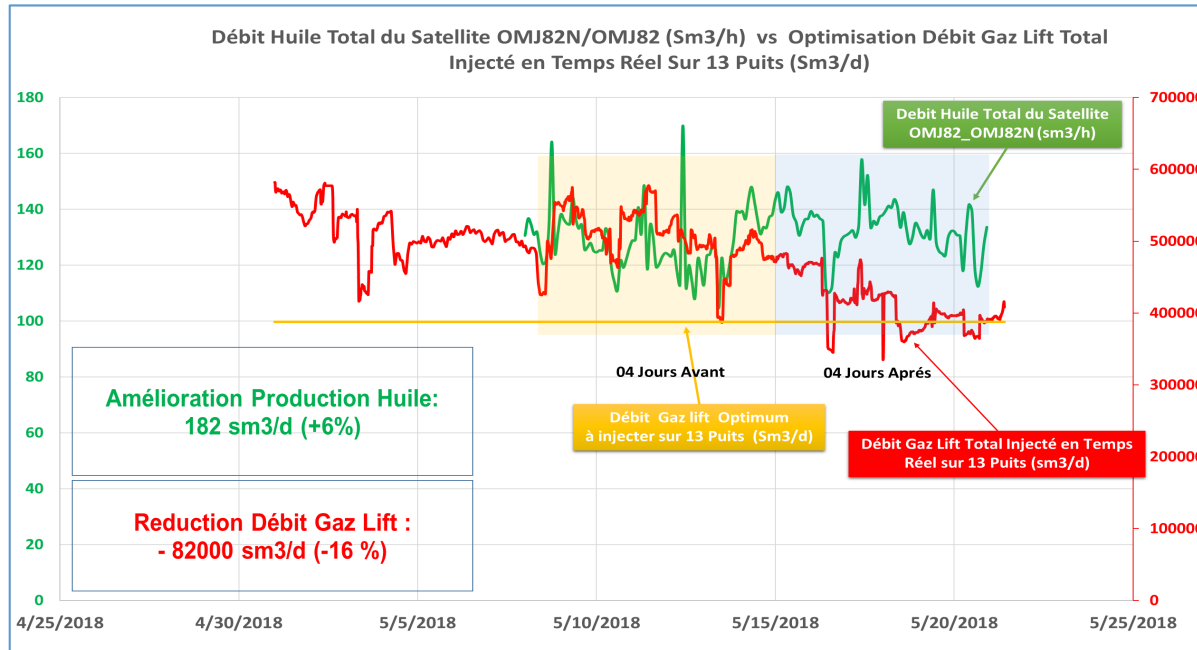Débit Huile Total du Satellite OMJ82N/OMJ82 (Sm3/h)  vs  Optimisation Débit Gaz Lift Total Injecté en Temps Réel Sur 13 Puits (Sm3/d)

Debit Huile Total du Satellite OMJ82_OMJ82N (sm3/h)

Amélioration Production Huile: 182 sm3/d (+6%)

Reduction Débit Gaz Lift : - 82000 sm3/d (-16 %)

04 Jours Avant

04 Jours Aprés

Débit Gaz lift Optimum à injecter sur 13 Puits (Sm3/d)

Débit Gaz Lift Total Injecté en Temps Réel sur 13 Puits (sm3/d)



Production gain after GL optimization

Before Optimization  After Optimization
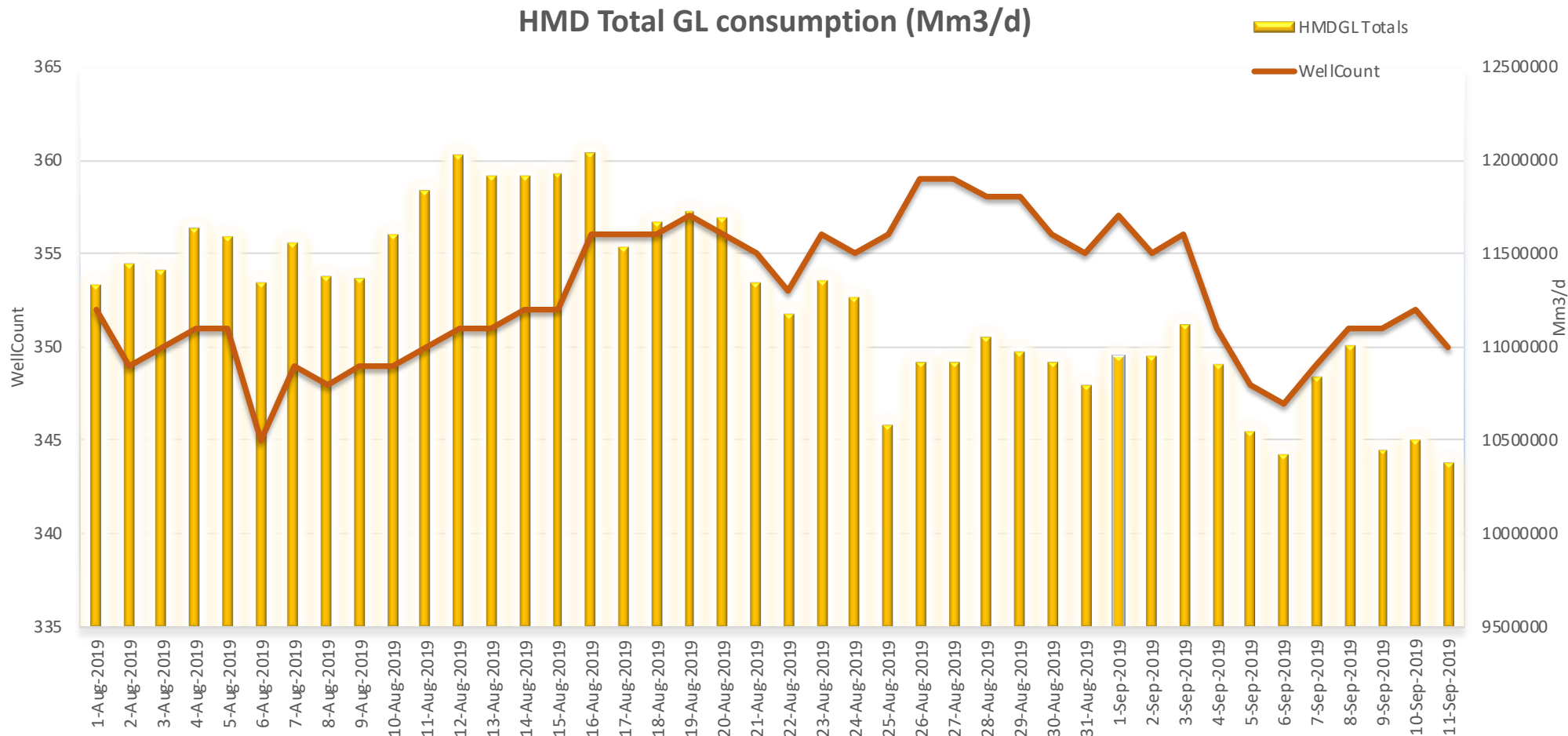
OMM50  OMN14  MD609  MD380  MD222  MD348

Test in Manifold OMJ82 - OMJ82N
Total Oil rate increase of 6 % (182 sm2/d) and Gas Lift Reduction of -16 % (82 k sm3/d) in the manifolds OMJ82 & OMJ82N during a test period.
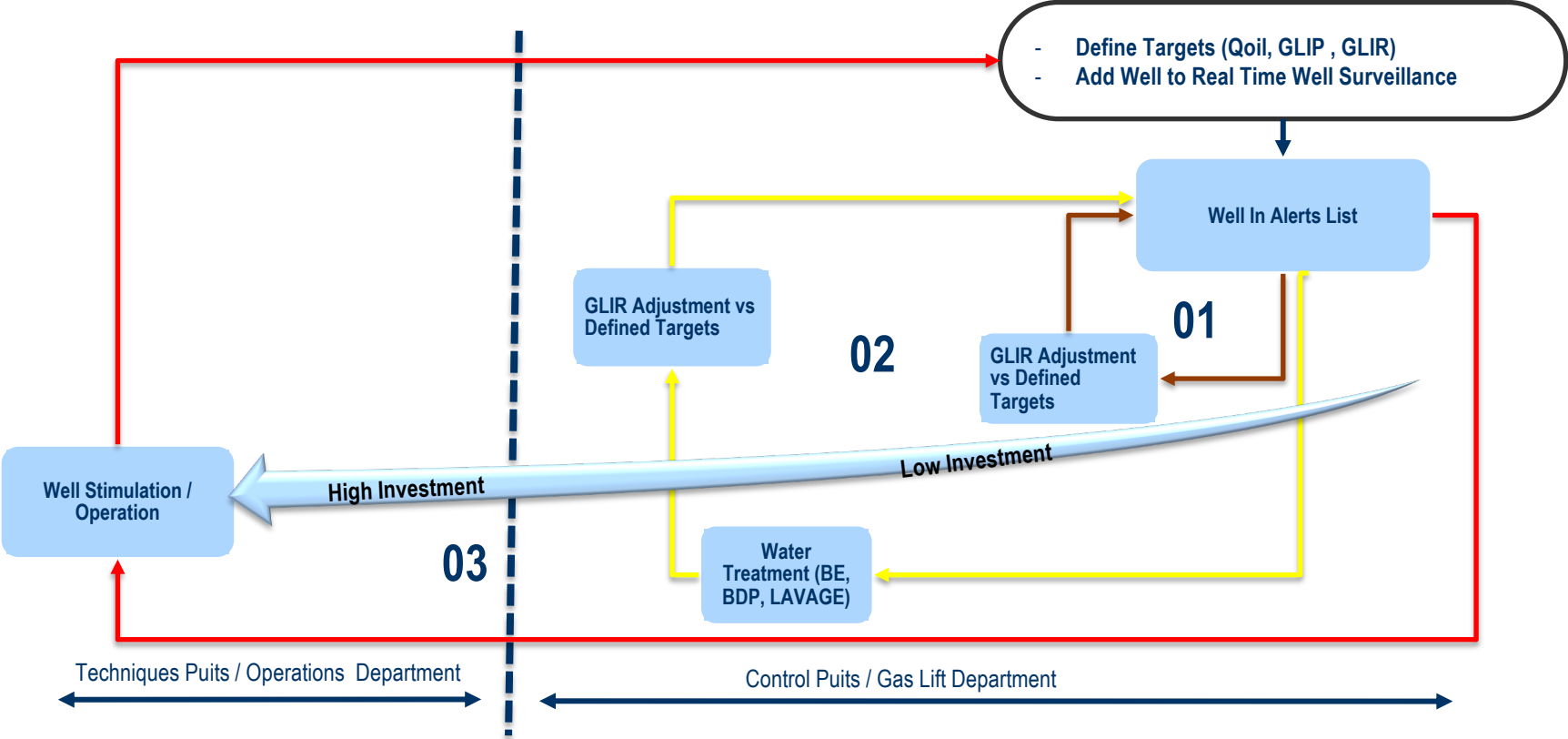
Oil rate increase in the selected wells, proven by production test before and after the implantation of the RTWS.

Schlumberger-Private

# Main Results : Gas Lift Injection Reduction



HMD Total GL consumption (Mm3/d)

Legend: HMDGL Totals (yellow bars), WellCount (orange line)

Total GL Consumption reduction by more than 1 million Sm3/d
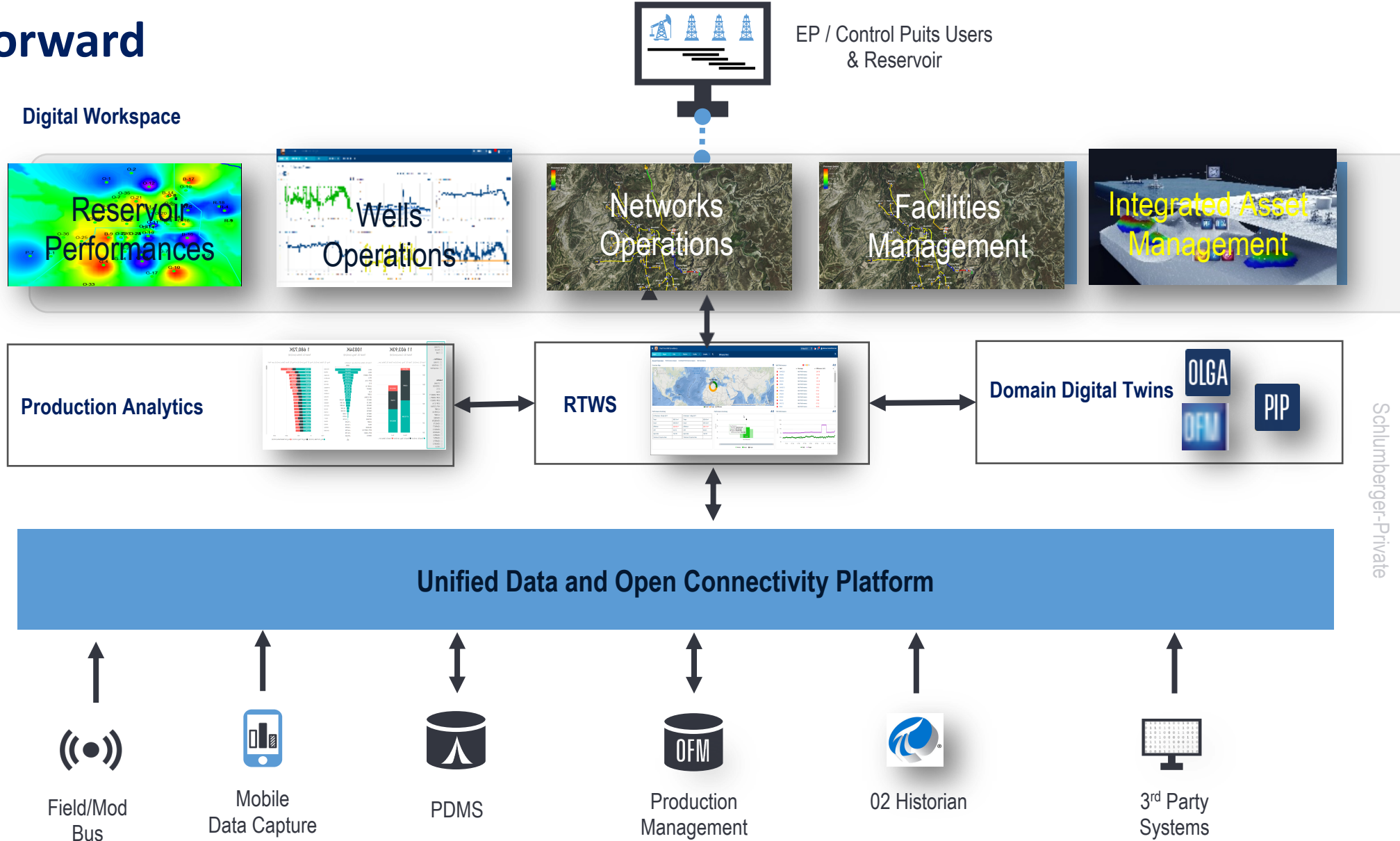
Schlumberger
sonatrach

# Main Results :   Time / Cost Saving



Time and cost saving by selection of the optimum time for the well interventions (Clean out, …).

# RTWS Way Forward

- Today the RTWS covers 50 % of HMD wells the objective to include all the wells: Gas Lift and Natural flow.

- Combine the RTWS with programmable valve technologies.

- Enlarge the Closed Loop to Remotely Controlled Production, Injectors and Separators

EP / Control Puits Users & Reservoir

**Digital Workspace**

Reservoir Performances

Wells Operations

Networks Operations

Facilities Management

Integrated Asset Management

**Production Analytics**

**RTWS**

**Domain Digital Twins**  OLGA  OFM  PIP

**Unified Data and Open Connectivity Platform**

Field/Mod Bus

Mobile Data Capture

PDMS

Production Management

02 Historian

3rd Party Systems

Schlumberger
sonatrach سوناطراك

Thank You